

WHAT IS CLAIMED IS:

1 1. A method of increasing the half life of a viral-specific ligand on a
2 mucosal membrane of an animal wherein said membrane is colonized with bacteria, said
3 method comprising: contacting the mucosal membrane with a viral-specific ligand
4 modified to bind to the surface of the bacteria colonizing the membrane.

1 2. The method of claim 1, wherein said viral-specific ligand is
2 modified to bind to a bacteria colonizing the mucosal membrane said bacteria selected
3 from the genera consisting of *Lactobacillus*, *Streptococcus*, *Staphylococcus*, *Lactococcus*,
4 *Bacteriodes*, *Bacillus*, and *Neisseria*.

1 3. The method of claim 1, wherein said viral-specific ligand is
2 modified by binding a bacterial-specific ligand.

1 4. The method of claim 3, wherein said bacterial-specific ligand is an
2 antibody.

1 5. The method of claim 4, wherein said antibody is an antibody
2 selected from the group consisting of: a single chain antibody, a F(ab), and a F(ab)2.

1 6. The method of claim 3, wherein said bacterial-specific ligand is
2 comprised of a peptide, a polypeptide, a protein, a carbohydrate, or a combination thereof.

1 7. The method of claim 3, wherein said bacterial-specific ligand is
2 selected from the group consisting of:
3 a C-terminal choline binding domain of LytA, a C-terminal choline
4 binding domain of PspA, a C-terminal domain of lysostaphin (SPA_{CWT}), a C-terminal
5 domain of InIB, an anti-S-layer protein antibody, and an anti-peptidoglycan antibody.

1 8. The method of claim 1, wherein said viral-specific ligand is
2 modified by binding a bacterial-specific ligand to said viral-specific ligand via a
3 bifunctional linking reagent.

- 1 9. The method of claim 1, wherein said viral-specific ligand is
2 modified by covalently binding a bacterial-specific ligand to said viral-specific ligand.
- 1 10. The method of claim 1, wherein said viral-specific ligand and the
2 bacterial-specific ligand are joined through a peptide linker.
- 1 11. The method of claim 3, wherein said viral-specific ligand is an
2 antibody.
- 1 12. The method of claim 11, wherein said antibody is selected from the
2 group consisting of: a single-chain antibody, a F(ab), and a F(ab)2.
- 1 13. The method of claim 1, wherein said viral-specific ligand is
2 comprised of a peptide, a polypeptide, a protein, a carbohydrate, or a combination thereof.
- 1 14. The method of claim 3, wherein said viral-specific ligand is
2 comprised of CD4, DC-SIGN, ICAM-1, HveA, HveC, poliovirus receptor, vitronectin
3 receptor, CD21, or IgA receptor sequences.
- 1 15. The method of claim 3, wherein said viral-specific ligand is a
2 carbohydrate.
- 1 16. The method of claim 15, wherein said carbohydrate is selected
2 from the group comprising sialic acid and heparin sulfate.
- 1 17. A chimeric molecule comprising a viral-specific ligand and a
2 bacterial-specific ligand wherein said bacterial-specific ligand binds to a bacteria that is
3 an inhabitant of a mucosal membrane.
- 1 18. The chimeric molecule of claim 17, wherein said bacterial-specific
2 ligand is an antibody.
- 1 19. The chimeric molecule of claim 17, wherein said antibody is
2 selected from the group consisting of: a single chain antibody, a F(ab), and a F(ab)2.

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1 20. The chimeric molecule of claim 17, wherein said bacterial-specific
2 ligand is comprised of a peptide, a polypeptide, a protein, a carbohydrate, or a
3 combination thereof.

1 21. The chimeric molecule of claim 17, wherein said bacterial-specific
2 ligand is selected from the group consisting of:
3 a C-terminal choline binding domain of LytA, a C-terminal choline
4 binding domain of PspA, a C-terminal domain of lysostaphin (SPA_{CWT}), a C-terminal
5 domain of InIB, an anti-S-layer protein antibody, and an anti-peptidoglycan antibody.

1 22. The chimeric molecule of claim 17, wherein said bacterial-specific
2 ligand binds to a bacteria selected from the genera consisting of *Lactobacillus*,
3 *Streptococcus*, *Staphylococcus*, *Lactococcus*, *Bacteriodes*, *Bacillus* and *Neisseria*.

1 23. The chimeric molecule of claim 17, wherein said viral-specific
2 ligand is an antibody.

1 24. The chimeric molecule of claim 17, wherein said viral-specific
2 ligand is an antibody selected from the group comprising: a single chain antibody, a
3 F(ab), a F(ab)₂.

1 25. The chimeric molecule of claim 17, wherein said viral-specific
2 ligand is comprised of a peptide, a polypeptide, a protein, a carbohydrate, or a
3 combination thereof.

1 26. The chimeric molecule of claim 17, wherein said viral-specific
2 ligand is comprised of CD4, DC-SIGN, ICAM-1, HveA, HveC, poliovirus receptor,
3 vitronectin receptor, CD21 or IgA receptor sequences.

1 27. The chimeric molecule of claim 17, wherein said chimeric
2 molecule is combined with a sterile aqueous solution.

1 28. The chimeric molecule of claim 27, wherein said solution is a
2 physiologically compatible solution.

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1 29. A method of manufacturing a chimeric molecule comprising the
2 step of joining a viral-specific ligand with a bacterial-specific ligand wherein said
3 bacterial-specific ligand binds to a bacteria that is an inhabitant of a mucosal membrane
4 and said viral-specific ligand binds to infectious viral particles.

1 30. The method of claim 29, wherein said viral-specific ligand is
2 comprised of CD4, DC-SIGN, ICAM-1, HveA, HveC, poliovirus receptor, vitronectin
3 receptor, CD21, or IgA receptor sequences.

1 31. The method of claim 29, wherein said chimeric molecule is
2 solubilized as a unit dose in a sterile, pharmaceutically acceptable solution.

1 32. The method of claim 29, wherein said viral-specific ligand and the
2 bacterial-specific ligand are joined through a peptide linker.

1 33. The method of claim 29, wherein said viral-specific ligand and the
2 bacterial-specific ligand are joined through a bifunctional linking reagent.

1 34. The method of claim 29, wherein said bacterial-specific ligand is
2 an antibody.

1 35. The method of claim 29, wherein said bacterial-specific ligand is a
2 carbohydrate.

1 36. A method of binding viral particles to bacteria inhabiting the
2 mucosal membrane of an animal comprising the steps of: (i) contacting the bacteria with a
3 viral-specific ligand having a bacterial-specific ligand; and, (ii) permitting viral particles
4 specifically recognized by said viral-specific ligand to bind to said bacteria.

1 37. A system for delivering a unit dose of a chimeric molecule to nasal
2 mucosa in a physiologically compatible solution comprising: (i) a chimeric molecule in a
3 sterile, pharmaceutically acceptable solution, said chimeric molecule comprising a viral-
4 specific ligand able to bind viral particles and a bacterial-specific ligand, wherein said
5 bacterial-specific ligand binds to a bacteria that is a natural inhabitant of a healthy
6 mucosal membrane and (ii) a container having first and second ends, wherein the first

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7 end is a base for containing the solution and the second end is a tapered tip having an
8 opening for delivering a metered and aerosol spray of the solution into a nasal passage.

1 38. The system of claim 37 where said first end is flexible and allows
2 for the transfer of pressure from the container to the solution allowing the fluid to be
3 emitted from said second end of the container.

1 39. A pharmaceutical composition comprising a therapeutically
2 effective amount of a chimeric molecule or a viral-specific ligand modified by binding a
3 bacterial-specific ligand.

1 40. The pharmaceutical composition of claim 39, wherein said
2 pharmaceutical composition is formulated as a member selected from the group
3 consisting of: a solution, a powder, a cream, a gel, an ointment, a douche, a suspension, a
4 tablet, a pill, a capsule, a nasal spray, a nasal drop, a suppository and an aerosol.

1 41. The pharmaceutical composition of claim 39, wherein said
2 pharmaceutical composition is formulated as a member selected from the group
3 consisting of: a pessary, a tampon, a gel, a paste, a foam, and a spray.

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